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(54) Method and device for preventing an unwanted skin from forming over the surface of a liquid

(57) A device for minimising or preventing the formation of a skin on the surface of a liquid, e.g. paint, contained in a container comprises a film or laminate of flexible plastics material the outer dimensions of which are substantially the same as or slightly less than a cross-section of the container so that the device float on and can cover substantially the entire surface of the liquid. The device is preferably made of so-called "bubble-plastic" and is conveniently in the form of a disc of "bubble-plastic" the edges of which are flattened and heat-sealed.

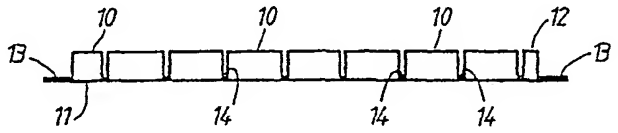

FIG. 2.

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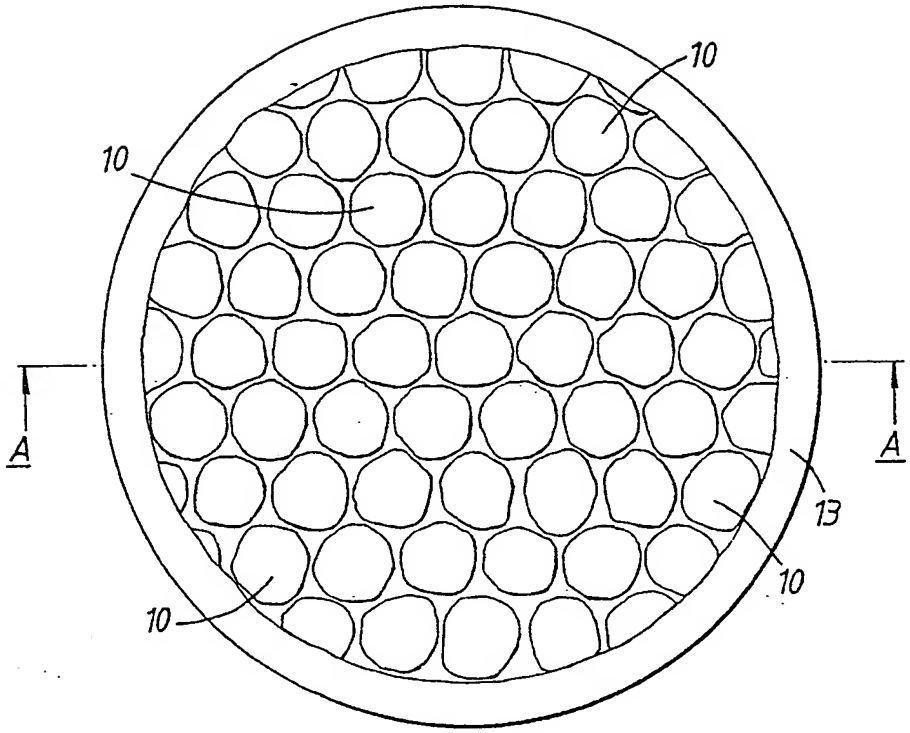

FIG. 1.

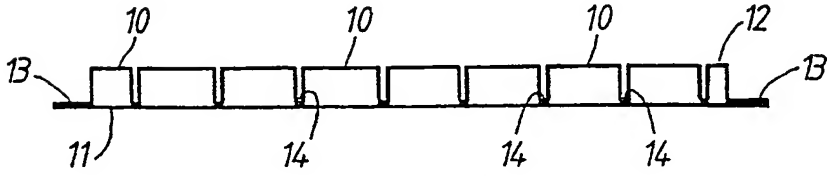

FIG. 2.

SPECIFICATION

Method and device for preventing an unwanted skin from forming over the surface of oil-bound paint

This invention relates to a method and device for the prevention of the formation of a skin on oil-bound paint and the like, principally in circumstances in which the paint is being stored in partially used paint tins.

Preamble

(1) Paint is defined in the Encyclopaedia Britannica, as a fluid suspension of finely divided solids which, when applied to a surface, will "dry" or set to an opaque film, either by oxidation or evaporation.

(2) A paint consists of a mixture of solid pigments and a liquid medium (known as the vehicle).

(3) When an oil paint is applied, the solvent, being volatile, rapidly evaporates from the painted surface, leaving behind the pigment and oil mixture as a wet coating. This mixture gradually dries into an elastic solid skin, owing to the oil absorbing oxygen from the air.

Introduction

(1) Put very simply, it is the very solvents and oils in paint that allow it to dry, that are responsible for enabling the paint to form a skin or film on the surface of the paint when it is stored in a partly-used tin, in which sufficient air has been trapped when the lid was replaced.

(2) It is principally with oil-based, coach and cellulose paints that skinning occurs when it is stored and, for these reasons, it is with these paints that the formation causes very real problems. These include:

(i) the inevitable waste when otherwise perfectly good paint is discarded because of the amount of small particles of skin that have permeated it.

(ii) the actual waste of paint caused by the formation of the actual skin.

(iii) the time that must be spent in either removing the skin or otherwise overcoming it, before the paint can be used.

(iv) the sub-standard workmanship that results if particles of skin are transferred from the tin of paint onto the surface being painted.

(v) the loss of time that results, especially when spraying paint, if particles of skin find their way into the spray gun, blocking the nozzle.

(3) When a tin of paint is full or nearly full, all that has to be done before using it, after removing the lid, is for the contents to be thoroughly stirred, which may be done either by hand or mechanically. This stirring is necessary, especially with oil-based paints, to ensure that the various constituents are well integrated. With a new tin of paint, especially if it has been manufactured for some time before being bought and used, it will be found that the solids have had time to separate out

(4) It will be noted that neither a film nor a skin forms in a sealed tin when it is full or nearly full. This is because there is insufficient air trapped in the tin to enable the "drying out" process to proceed on the surface of the paint.

(5) However, once the level of paint in a tin has dropped as a result of paint being extracted during painting, the air trapped in the tin when the lid is replaced after use, will cause this drying out process to commence. When this happens, first a thin film grows on the surface of the paint and, in time, this grows into a skin which grows thicker and stronger the longer it is left.

(6) The speed with which skin forms on the surface of paint, is dependent on the volume of trapped air that is present, and the relation of this to the surface area of the paint.

Dealing with skin on or in paint

(1) Once filming has started or a skin has grown, it must be either removed or otherwise dealt with before the paint can be used.

(2) Dealing first with its removal;

(i) if the skin is of sufficient strength and thickness, it is not too difficult to separate it from where it has stuck to the inside of the tin and to remove it in one piece. This is admittedly messy and, once removed, the skin must be disposed of. But it does mean that the operator can be fairly certain that all the skin has been removed.

(ii) But if the skin is not of sufficient maturity (strong and thick enough) it will inevitably tear, either when it is being separated from the inside walls of the tin, or whilst it is being removed. When this happens, time must be spent in searching for, finding and then removing all the separate pieces. This is very important as if all the pieces of skin are not removed, when the paint is stirred the pieces will be broken down into even smaller pieces.

(iii) But it is when the paint has not yet grown into a skin and is still only a film, that the greatest difficulty is experienced in trying to remove it. It is true that it can be scooped out using a fine-gauge strainer, but this in itself is not only messy, but it is almost impossible to ensure that all the film has been removed. When the paint is then stirred, any remaining film will be dispersed throughout the paint, and this will only become apparent when it turns up as blemishes on the surface being painted.

(3) Turning now to ways of dealing with skin other than by removing it. There are several methods that can and are being used, but all with only varying degrees of success and ease. These methods are:

(i) the paint can be strained, being poured through a suitable strainer into another tin, from where it is used.

(ii) alternatively, after straining and after the original tin has been cleaned of any skin that may remain, the paint can be transferred back into it and used from there.

(iii) instead of straining the paint and then us-

tin, the paint allowed to strain through into the middle of the strainer, and used from there.
NOTE: A suitable strainer for use in (3)(iii) can be manufactured by removing the bottom from an empty tin of suitable size, stretching an old fine-denier nylon over the end and security it in place with an elastic band. Whilst this is effective and, indeed, I have used this method successfully for a number of years, the nylon on the bottom of the tin has to be cleaned thoroughly after use, as if this is not done the mesh will become clogged with dried paint.

Alternatively, and this was actually shown and recommended on television recently, an old nylon stocking can be simply pushed down into the tin of paint, and the paint brush pushed down inside the stocking to load the paint brush with paint. Naturally, a new nylon has to be used each time, and the used paint-filled one has to be removed and disposed of - a messy operation.

Preventing skin from forming

(1) As an alternative to removing or otherwise overcoming skin in paint once it has formed, steps can be taken to stop the skin forming in the first place. There is more than one way in which this could be achieved. Some are practical, others are not. Of the practical ways, one has actually been marketed. These ways are:

(i) since it is the air trapped in a part-used tin of paint after the lid has been replaced that causes the skin to form, the obvious answer is to extract all or most of the air. A few years ago I had a tool that did just this. It consisted of a hand-operated vacuum pump, which had a sharp spike on the end with which to puncture the lid of the tin. On the bottom of the actual pump was a rubber cup.

After the lid had been replaced on the tin of paint, a hole was punched in the centre of the lid and a rubber disk with a slightly sticky base was placed over the hole. The rubber cup on the end of the pump was then placed over the disk and the pump operated. At the end of each stroke, the disk acted as a one-way valve stopping air from returning into the tin. On the next vacuum-forming stroke the disk lifted. When a sufficiently high vacuum had been formed, the pump was removed and the disk pressed firmly down over the hole to ensure an air-tight seal.

There were three drawbacks to this system, although it certainly did stop the formation of skin. These drawbacks were:

(a) if for any reason the vacuum was lost, there was no way of telling until the tin was opened and it was found that a skin had formed.

(b) there was no way of telling how high a vacuum was being formed when the pump was being operated. If too high a one was created, the tin could be, and sometimes was, partially collapsed. This was not serious in itself, providing the lip on the tin was not distorted, thus destroying the air-tight seal between it and the lid.

On the other hand, if too low a vacuum was created, sufficient air would remain in the tin to permit the formation of skin to take place. In both these cases, the effects would only be known when the tin was reopened, possibly after the passage of some long time.

(c) There were not, as far as I know, very many shops selling the vacuum pump and, of far greater importance, the sealing disks. Although these looked like the patches used to repair puncture on the inner tubes of bicycles, they were different, and no other patches seemed to work.

(2) As an alternative to creating a vacuum in the sealed tin of paint, it would be possible to replace the air with an inert gas that would stop the formation of skin. But this idea is too impractical to be given serious consideration.

(3) The only other alternative, and this one does not actually stop the formation of skin, but rather overcomes (it is claimed) the problem. In this method, after the lid has been replaced on the tin of paint, it is stored upside down. As a result, when the skin forms, it does so on what will be the bottom of the paint when the tin is turned back the right way up.

The theory is undoubtedly right but, unfortunately, it does not take into account two very important factors:

(i) when the skin is still thin, it will be unable to support the weight of paint above it when the tin is turned the right way up and, even when the skin is strong enough to withstand this, it may well not be strong enough to withstand the pressure when the paint is stirred.

(ii) if the skin should break, either as a result of the weight of paint above it, or whilst being stirred, and especially when this is done mechanically, it will be difficult to ensure that all the pieces are removed, since they will be below the surface of the paint and not floating on it.

Finally, if the paint is stored upside down for only a short time, although there will not be a skin, there will be a film; and when this disintegrates, as it is bound to, not only will this fact not be known but, even if it was, there would be no way of removing the bits of film except by using a very fine strainer - the very use of which would nullify the object of storing the paint upside down!

Conclusion

If the forgoing is accepted, the inevitable conclusion must be that:

(1) the existing methods of removing film and skin from paint are anything but ideal.

(2) the existing methods of either straining paint to remove the skin, or picking up paint after it has passed through some kind of strainer in the tin, are wasteful, messy and time-consuming.

(3) the existing method of turning the tin of paint upside down during storage, only works when the skin is thick and strong - and only works then if the paint is stirred carefully.

(4) although the vacuum method of stopping the formation of skin has the least drawbacks and does actually work, it is believed that the system is no longer available.

Of the four options listed above, it is apparent that the ideal method of dealing with the skinning

properties of paint when it is stored in a partly-used tin, is to prevent it forming in the first place. From this, it follows that the only practical way of achieving this, is to prevent the skin-generating air from making contact with the surface of the paint whilst it is being stored. The method would need to be different from any so far discussed, so there would appear to be only one option - to insert something into the tin of paint which will achieve the object of keeping air away from the surface of the paint.

Criteria

The criteria that such an object must meet are:

(1) It must be simple and uncomplicated.

(2) It must be near enough to foolproof in operation.

(3) It must be simple and uncomplicated to manufacture, cheap to produce and cheap to buy.

(4) Ideally, it should be something that could be sold by a non-paint manufacturing company (so it could be sold in manufacturer-owned shops), but by a company whose products are to be found in just about all retail outlets selling paint, and especially those catering to the do-it-yourself market.

(5) Finally, of course, the object must be one hundred per cent effective, work with all kind and types of paint, and work under almost very conceivable condition.

In the method according to the invention a film or a laminate of flexible plastics material of suitable dimensions is placed on top of the surface of the paint within its container, the dimensions being such as to substantially cover the entire said surface. The plastics material must be strong to prevent mechanical damage in use, yet be of sufficiently light weight to naturally float on the surface of the paint, notwithstanding the possibility of being wetted by the paint on both of its surfaces. The material must be inert with respect to the paint solvents and any oils contained therein. Preferably the plastics material should be relatively bulky so as to ease the handling problem thereof, which particularly arises when one of its surfaces is wetted by paint. The dimensions of the film or laminate should preferably be slightly less than the internal dimensions of the paint container so as to minimise the possibility of the film or laminate from adhering to the vertical sides of the container, thereby leaving part of the surface uncovered.

The device according to the invention comprises a disc of suitably chosen plastics material for use in accordance with the above-described method having a dimensions which is slightly less than the inside diameter of the paint container for which it is intended. The preferred material of the device comprises a laminate of two or more light-weight plastics films having an air-filled cellular structure in which the cell or cells have sealed walls to prevent the ingress of paint. A suitable material is formed of two piles, one of which is planar and the other configured to provide the cellular structure and is heat-welded to the first. A common form of this material, known as "bubble plastic" is used as a protective wrapping for merchandise. Such material has the desired bulkiness in relation to its weight and inherent strength with flexibility. In the preferred form the two plies forming the disc are heat-welded together continuously around their circumference so as to provide a strengthened edge to the disc. In use the disc is placed so that the planar surface is in contact with the paint surface.

A preferred embodiment of the skin-preventing device in the form of a disc of "bubble plastic" is illustrated in Figures 1 and 2 of the accompanying drawing. Figure 1 shows the device, looking down directly onto the upper surface. The cellular construction in the form of a plurality of approximately 10 mm diameter bubbles 10 is cearly visible. At the circumference of the disc the plies 11, 12 forming the "bubble plastic" material are flattened and welded together to provide a strengthened edge 13.

Figure 2 is a section through the disc of Figure 1 in the plane A-A. It will be seen that the disc is formed from two plies each of thin plastics film. The bottom ply 11 is planar. The upper ply 12 is formed originally with a plurality of closely packed, open cells. Each cell is joined in the upper ply 12 to its neighbouring cells by a flange or web of material 14 forming part of the plastics film and these flanges abut the bottom ply and are heat-welded thereto, thereby providing an array of sealed air-filled bubbles. At the edges 13 the two plies 11, 12 are flattened together and heat sealed.

Why bubble plastic is ideal

This material has proved ideal for four main reasons:-

(1) Because it is flexible, it immediately regains its shape after being inserted into a tin of paint.

(2) Because of the bubbles of trapped air, it is very buoyant and will not, therefore, sink into the paint when it comes into contact with it.

(3) It is thick enough to limit the contact of air with the paint surface even though a clearance may be provided between the edge of the disc and the inside walls of the tin. If a seal does form with the walls of the tin then this seal is broken easily when the time comes to remove the disc because of the thinness of the sheets from which the disc is formed.

(4) Because it is manufactured from clear plastic which is also very strong (as compared with a skin of paint), it is easy to see when the device has made contact with the surface of the paint. This would be so, even if there was an instruction label stuck on the top side and if the colour of the paint was white.

Inserting the skin-preventing device

(1) When the level of paint in a tin has fallen to a level where there is a possibility that skin may start to form, a skin-preventing device according to the invention of the appropriate size is placed centrally on top of the opened tin. Next, another tin, smaller than the opening of the container, is used to push the device into the tin, there being sufficient clearance provided to ensure that the plastic

bubbles are not damaged. The second tin is placed on top of the device and pressed gently downwards, pushing it past the lip of the tin and into the tin itself.

(2) The small tin is then removed if the level of the paint is too low for it to push the device onto the surface of the paint, and some other object, such as a pencil or a screwdriver, is used to push the device down until its centre is in contact with the surface of the paint. The same implement is then used to do the same with the sides of the device.

(3) It should be noted that one surface of the plastic bubble material is smoother than the other, and it is this side which should make contact with the surface of the paint. In actual fact, it is not actually essential for the device to make contact with the surface of the paint in order to prevent the formation of skin, as it has been estimated that no skin would form even if the device was two fingers' width above the surface of the paint.

(4) With the device in position, the lid of the paint tin is replaced in the normal way, although it will have no effect on the efficiency of the device were it left off. However, if the lid is replaced, it does ensure that dust and dirt cannot enter the tin in storage, with the possibility of it falling into the paint when the device is removed.

Removal

In a few short words, when the device according to the invention has to be removed, it is treated in exactly the same way as it would be were it a strong skin of paint.

Storing paint protected by the device according to the invention

No special precautions need to be taken once the tin of paint has been stored. However, the tin should not be shaken or tilted too far, to ensure that there is no possibility of the device becoming displaced and adhering to the walls of the container.

Types of paint suitable for the device according to the invention

The device may be usefully used on all types of paint including: water- and oil-based, coach and spraying cellulose ones. With regard to cellulose paints, a piece of bubble packing was immersed in concentrated cellulose thinners for over half-an-hour. On inspecting it, it was found that the plastic was not even slightly sticky, indicating that this plastic at least, is impervious to cellulose paints.

With such paints as vinyl, the problem is not so much one of the paint skinning, but of the bits and pieces that fall into it, especially when the lid is hammered home, which it often has to be on the larger tins (which are more often bought). Also, but to a lesser extent, the same thing happens when the lid is prised off. Therefore, if a device according to the invention was used, these bits and pieces would fall on top of it, and could be removed when it was removed.

The same method, and for the same reasons, can be usefully employed with non-drip paints.

It should be noted that with both these types of paint, it is recommended that after the lid has been replaced, the tin should be given a good shaking. The object of doing this is to ensure that there is a good seal between the lip of the tin and the lid. However, if a device according to the invention is used, the tin, for obvious reasons, must not be shaken.

Sizes of device according to the invention

Since there is no theoretical restriction on the size of device that can be produced, they could be manufactured in any diameter or shape, to fit any size and shape of tin or other container.

CLAIMS

1. A device for minimising or preventing the formation of skin on the surface of a liquid contained in a container, wherein the device comprises a film or laminate of flexible plastics material the outer dimensions of which are substantially the same as or slightly less than those of a cross-section of the container so that the device can substantially cover the entire surface of said liquid.

2. A device as claimed in claim 1, wherein the device is capable of floating on the liquid.

3. A device as claimed in claim 1 or 2, wherein the device is in the form of a laminate of two or more light-weight plastics films having an air-filled cellular structure in which the cell or cells have sealed walls to prevent the ingress of liquid.

4. A device as claimed in claim 3, wherein the laminate comprises a planar lower ply to contact the surface of the liquid and an upper ply secured in regions to the lower ply such as to form a plurality of closely-packed air-filled cells.

5. A device as claimed in claim 4, wherein at the edges of the device the two plies are flattened together and heat-sealed.

6. A device as claimed in anyone of claims 1 to 5, wherein the device is in the form of a disc.

7. A device as claimed in any one of claims 1 to 6, wherein the plastics material is inert with respect to paint and paint solvents and the device is adapted for use with paint as said liquid.

8. A device for minimising or preventing the formation of skin on the surface of a liquid contained in a container substantially as hereinbefore described with reference to the accompanying drawings.

9. A method of minimising or preventing the formation of skin on the surface of a liquid contained in a container, wherein a device as claimed in anyone of claims 1 to 8 is placed on top of the liquid in its container so as substantially to cover the entire surface of the liquid.

10. A method as claimed in claim 9 wherein said liquid is paint.

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